

AD-A081 564

ADMIRALTY EXPERIMENT WORKS HASLAR (ENGLAND) F/G 13/10
SEA KNIFE ANALYSIS OF SELECTED SEAKEEPING DATA. VOLUME 1.(U)
NOV 76 M A HAMMOND, K NICHOLSON N68171-76-V-9910
UNCLASSIFIED AEW-TR-N76034-VOL-1 NL

1 of 1
5 pages



END
DATE
FILMED
4-80
DTIC

- (21466) ELL.

AEW TR N76034

Copy No 1

AEW



M A Hammond

K Nicholson

ADMIRALTY EXPERIMENT WORKS

HASLAR GOSPORT

HAMPSHIRE PO 12 2AG

PROCUREMENT EXECUTIVE

MINISTRY OF DEFENCE

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

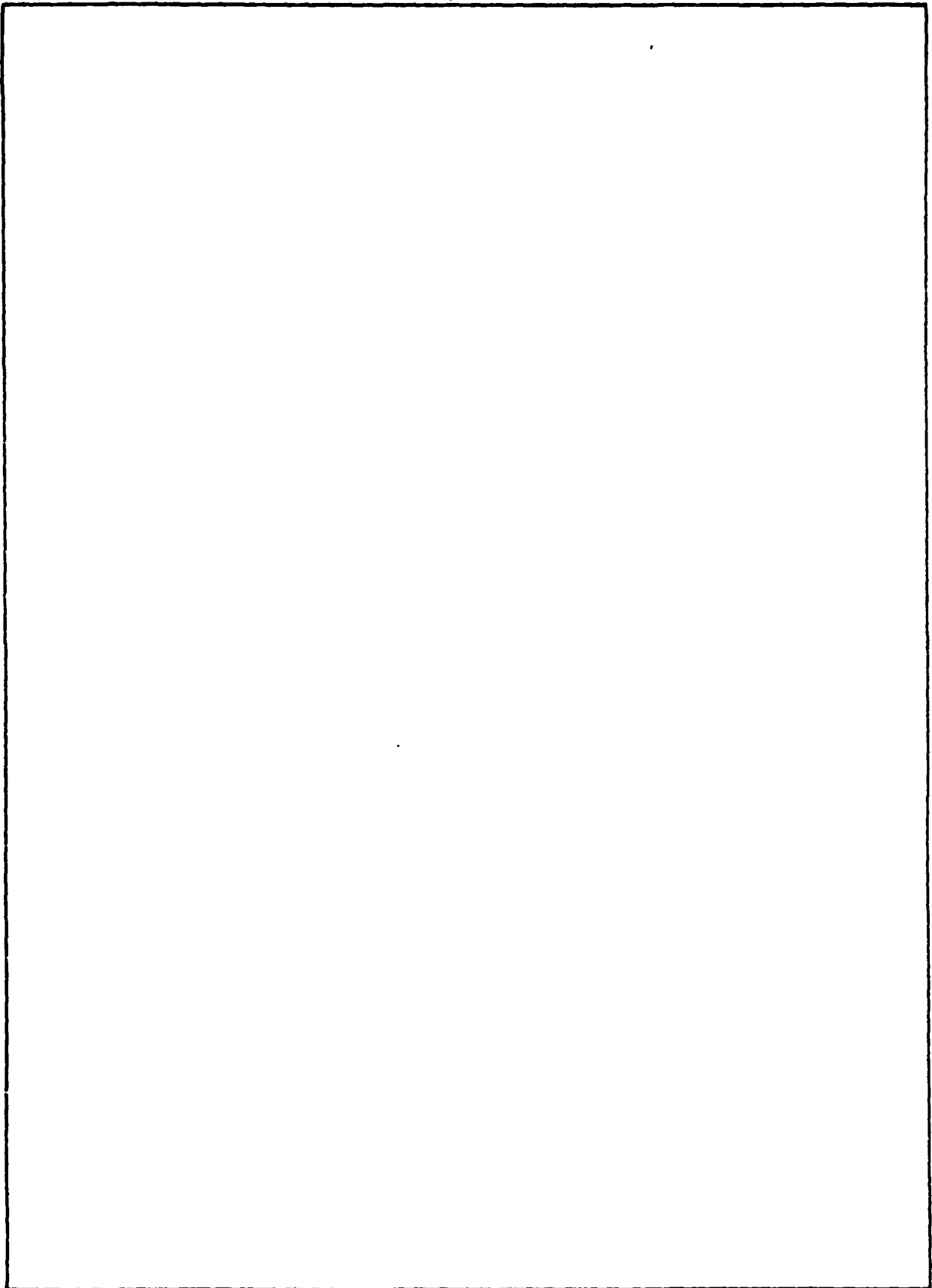
UNCLASSIFIED

November 1976

80-2 27 178

AEW TR N73034

1
SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)



REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING
1. REPORT NUMBER AEW TR NT6034	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Sea Knife - Analysis of Selected Seakeeping Data Vol. I (U)		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) M. A. Hammond K. Nicholson		8. CONTRACT OR GRANT NUMBER(s) Payne, Inc. N00014-75-C-0926 P00005
9. PERFORMING ORGANIZATION NAME AND ADDRESS Admiralty Experiment Works Hampshire PO 12 2 AG England		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
		13. NUMBER OF PAGES Vol. I-17 Vol. II-115
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) DTNSRDC Bethesda, Maryland 20084		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Unlimited and approved for Public release.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Vol. I Report Vol. II Figures This report used by OP96V in their study: Advanced Naval Vehicle Concepts Evaluation.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Advanced Naval Vehicle Concepts Evaluation ANVCE Technology Assessment Sea Knife Seakeeping Data (Selected) Planing Ship		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report presents the results of spectral analysis on a selection of seakeeping tests carried out on a 1/16 full size model of SEA KNIFE. SEA KNIFE is an experimental planing hull design.		

ADMIRALTY EXPERIMENT WORKS, HASLAR

9
AEW TECHNICAL REPORT N76034

(14) AEW-TR-N76034-V.1-1

(6) SEA KNIFE

ANALYSIS OF SELECTED SEAKEEPING DATA. Volume 1.

(U)

(15) H. 511-1-10-I-931

BY

M. A. HAMMOND
K. NICHOLSON

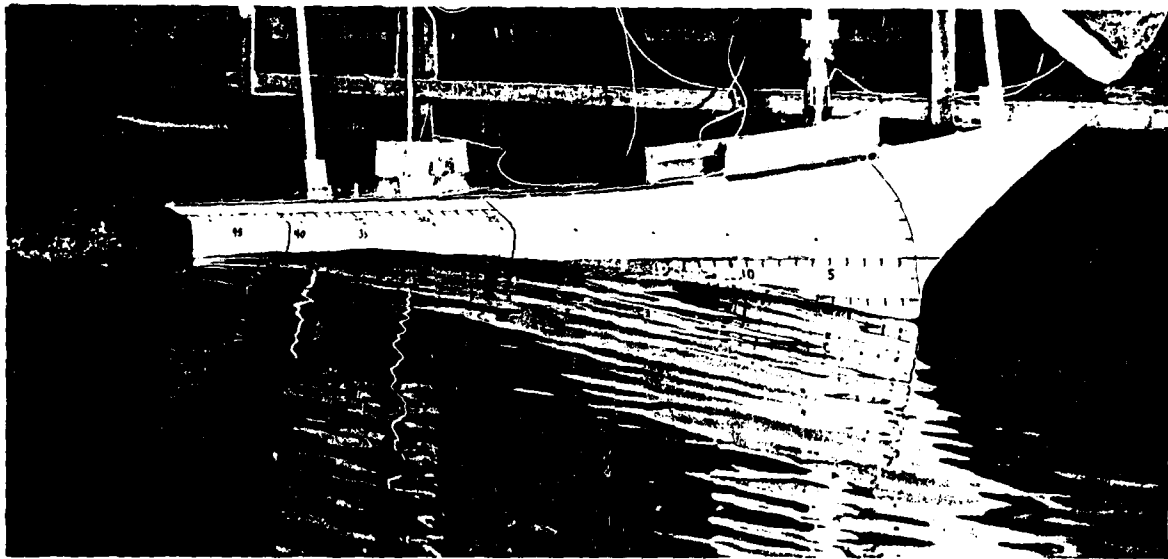
11 NOV 1976

13 18

PROCUREMENT EXECUTIVE
MINISTRY OF DEFENCE

04/100

A



Contents

Volume 1

	Page
Frontispiece. Model in Waves.	
Summary.	vii
1. Introduction.	1
2. Description.	1
3. Results.	1
References	2
Table 1. Model and Ship Particulars.	3
Table 2. Test Programme.	4
Table 3. Measured Parameter Range and Recording Media.	4
Table 4. Results for Hard Chine Model (Configuration 1) in Sea State 3.	5
Table 5. Results for Hard Chine Model (Configuration 1) in Sea State 5.	6
Table 6. Results for Round Bilged Model with Spray Reversers (Configuration 2) in Sea State 3.	7
Figure 1. SEA KNIFE Model Configuration 1.	
Figure 2. SEA KNIFE Model Configuration 2.	

Volume 2 - Spectra

Figure 3. Run 878 Pitch.	
Figure 4. Run 878 Heave.	
Figure 5. Run 878 CG Acceleration.	
Figure 6. Run 878 Bow Acceleration.	
Figure 7. Run 878 Encountered Wave.	
Figure 8. Run 879 Pitch	
Figure 9. Run 879 Heave.	
Figure 10. Run 879 CG Acceleration.	
Figure 11. Run 879 Bow Acceleration.	
Figure 12. Run 879 Encountered Wave.	

Figure 13. Run 883 Pitch.
Figure 14. Run 883 Heave.
Figure 15. Run 883 CG Acceleration.
Figure 16. Run 883 Bow Acceleration
Figure 17. Run 884 Pitch.
Figure 18. Run 884 Heave.
Figure 19. Run 884 CG Acceleration.
Figure 20. Run 884 Bow Acceleration.
Figure 21. Run 884 Encountered Wave.
Figure 22. Run 889 Pitch.
Figure 23. Run 889 Heave.
Figure 24. Run 889 CG Acceleration.
Figure 25. Run 889 Bow Acceleration.
Figure 26. Run 889 Encountered Wave.
Figure 27. Run 890 Pitch.
Figure 28. Run 890 Heave.
Figure 29. Run 890 CG Acceleration.
Figure 30. Run 890 Bow Acceleration.
Figure 31. Run 890 Encountered Wave.
Figure 32. Run 891 Heave.
Figure 33. Run 891 CG Acceleration.
Figure 34. Run 891 Bow Acceleration.
Figure 35. Run 891 Encountered Wave.
Figure 36. Run 893 Pitch.
Figure 37. Run 893 CG Acceleration.
Figure 38. Run 893 Bow Acceleration.
Figure 39. Run 893 Encountered Wave.
Figure 40. Run 894 Pitch.

Figure 41. Run 894 Heave.
Figure 42. Run 894 CG Acceleration.
Figure 43. Run 894 Bow Acceleration.
Figure 44. Run 894 Encountered Wave.
Figure 45. Run 896 Pitch.
Figure 46. Run 896 Heave.
Figure 47. Run 896 CG Acceleration.
Figure 48. Run 896 Bow Acceleration.
Figure 49. Run 896 Encountered Wave.
Figure 50. Run 897 Pitch.
Figure 51. Run 897 Heave.
Figure 52. Run 897 CG Acceleration.
Figure 53. Run 897 Bow Acceleration.
Figure 54. Run 897 Encountered Wave.
Figure 55. Run 898 Pitch.
Figure 56. Run 898 CG Acceleration.
Figure 57. Run 898 Bow Acceleration.
Figure 58. Run 898 Encountered Wave.
Figure 59. Run 899 Pitch.
Figure 60. Run 899 CG Acceleration.
Figure 61. Run 899 Bow Acceleration.
Figure 62. Run 899 Encountered Wave.
Figure 63. Run 900 Pitch.
Figure 64. Run 900 Heave.
Figure 65. Run 900 CG Acceleration.
Figure 66. Run 900 Bow Acceleration.
Figure 67. Run 900 Encountered Wave.
Figure 68. Run 908 CG Acceleration.
Figure 69. Run 908 Bow Acceleration.

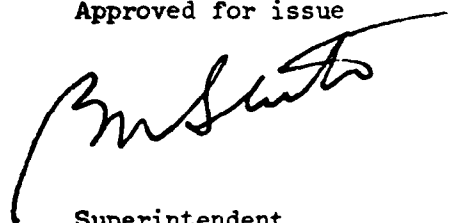
Figure 70. Run 39 Pitch.
Figure 71. Run 909 CG Acceleration.
Figure 72. Run 909 Bow Acceleration.
Figure 73. Run 909 Encountered Wave.
Figure 74. Run 924 Pitch.
Figure 75. Run 924 Heave.
Figure 76. Run 924 CG Acceleration.
Figure 77. Run 924 Bow Acceleration.
Figure 78. Run 924 Encountered Wave.
Figure 79. Run 925 CG Acceleration.
Figure 80. Run 925 Bow Acceleration.
Figure 81. Run 928 Pitch.
Figure 82. Run 928 Heave.
Figure 83. Run 928 CG Acceleration.
Figure 84. Run 928 Bow Acceleration.
Figure 85. Run 928 Encountered Wave.
Figure 86. Run 929 Pitch.
Figure 87. Run 929 Heave.
Figure 88. Run 929 CG Acceleration.
Figure 89. Run 929 Bow Acceleration.
Figure 90. Run 929 Encountered Wave.
Figure 91. Run 930 Pitch.
Figure 92. Run 930 Heave.
Figure 93. Run 930 CG Acceleration.
Figure 94. Run 930 Bow Acceleration.
Figure 95. Run 930 Encountered Wave.
Figure 96. Run 931 Pitch.
Figure 97. Run 931 Heave.

Figure 98. Run 931 CG Acceleration.
Figure 99. Run 931 Bow Acceleration.
Figure 100. Run 931 Encountered Wave.
Figure 101. Run 935 Pitch.
Figure 102. Run 935 Heave.
Figure 103. Run 935 CG Acceleration.
Figure 104. Run 935 Bow Acceleration.
Figure 105. Run 935 Encountered Wave.
Figure 106. Run 936 Pitch.
Figure 107. Run 936 Heave.
Figure 108. Run 936 CG Acceleration.
Figure 109. Run 936 Bow Acceleration.
Figure 110. Run 936 Encountered Wave.
Figure 111. Run 937 Pitch.
Figure 112. Run 937 Heave.
Figure 113. Run 937 CG Acceleration.
Figure 114. Run 937 Bow Acceleration.

Summary

1. This Report presents the results of spectral analysis on a selection of seakeeping tests carried out on a $1/16$ full size model of SEA KNIFE in No 1 Ship Tank.
2. The work was undertaken on behalf of DTNSRDC under contract number N68171-76-V-9910, and formed part of the US Navy Project on Advance Naval Vehicle Concept Evaluations.

Approved for issue

A handwritten signature in dark ink, appearing to read 'B. Smith', is written over the printed title 'Superintendent'.

Superintendent

SEA KNIFE
ANALYSIS OF SELECTED SEAKEEPING DATA

By M A Hammond
K Nicholson

1. INTRODUCTION

Resistance and seakeeping tests were conducted in No 1 Ship Tank during May 1976 on a $1/16$ full-scale model of SEA KNIFE.

The purpose of the project, the model configurations, calm water resistance data and experimental arrangements were reported in Reference 1.

AEW was subsequently requested by DTNSRDC to analyse a selection of the data from the seakeeping tests on a repayment basis under contract number N68171-76-V-9910.

This Report presents the results of the requested seakeeping analysis.

2. DESCRIPTION

Photographs of the two model configurations are shown in Figures 1 and 2 respectively, whilst model and ship particulars are given in Table 1 and the irregular seas test programme is summarised in Table 2. Table 3 lists the measured parameters, their ranges and the media on which they were recorded.

This Report contains the results of spectral analysis for the 26 runs selected by DTNSRDC using an adaption of the auto-correlation method outlined in Reference 2.

The resistance in waves was recorded only on ultraviolet paper and a mean level has been determined by averaging peaks and troughs. An estimate of the calm water resistance has been made for the appropriate conditions from measured data and the added resistance deduced as the difference between the two values. No value is available for run 878 as the trace was unreadable.

Certain of the magnetic tape records were unsuitable for computer analysis for a variety of reasons including their short duration and high noise to signal ratios. Root mean square (rms) values have been calculated from the downstream ultraviolet records for these cases and the appropriate values are indicated in Tables 4-6 by an asterisk (*)

No value of heave was recorded on runs 898, 899, 908 and 909.

3. RESULTS

The analysed data for configuration 1 in sea state 3 are in Table 4 and the associated spectra are presented in Figures 3-35. Results for configuration 1 in sea state 5 are given in Table 5 and Figures 36-73, whilst the results of configuration 2 tests in sea state 3 are shown in Table 6 and Figures 74-114.

Figures 3 to 114 are contained in Volume 2 of this report.

References

- Reference 1. AEW-TM-76027. SEA KNIFE Calm Water Resistance Experiments (U). By G W Robson. July 1976. COMMERICAL IN CONFIDENCE.
- Reference 2. Theory of Seakeeping. By B V Korvin-Kroukovsky. SNAME 1961.

Table 1

MODEL AND SHIP PARTICULARS($\alpha = 17.5$ Degrees Hard Chine Bottom No Spray Reversers)

	Model	Ship
L_{OA} metres (ft)	1.497 (4.91)	23.952 (78.6)
L_{WL} metres (ft)	1.259 (4.13)	20.144 (66.1)
L_{PP} metres (ft)	1.219 (4.00)	19.504 (64.0)
L_K metres (ft)	1.036 (3.40)	16.576 (54.4)
B (at WL without spray reversers) metres (ft)	0.390 (1.28)	6.240 (20.5)
B (max at deck) metres (ft)	0.591 (1.94)	9.456 (31.0)
T (standard condition) metres (ft)	0.069 (0.227)	1.104 (3.6)
T (heavy condition) metres (ft)	0.081 (0.267)	1.296 (4.3)
Mass (standard condition) kg (lb)	12.950 (28.55)	54430 (120,000)
Mass (heavy condition) kg (lb)	16.175 (35.66)	68040 (150,000)

Table 2

TEST PROGRAMME

Irregular Head Sea Experiments		
Test 15	Configuration 1 Prototype speeds, 5, 14, 20, 30, 40, 45 knots State 3 and state 5	Standard condition
Test 16	Configuration 1 Speeds as above State 3 only	Heavy condition
Test 17	Configuration 2 Speeds as above State 3 only	Standard condition
Tests 1-11	Were conducted at US Naval Academy	
Tests 12-14	Were calm water resistance experiments at AEW	

Table 3

MEASURED PARAMETER RANGE AND RECORDING MEDIA

Parameter	Range	Medium
Pitch	± 9 degrees	Digital magnetic tape (DMT)
Heave (at CG)	± 7 cms	DMT
Vertical acceleration at CG	5 g	DMT
Vertical acceleration at bow	5 g	DMT
Encountered wave height	± 22 cms	DMT
Towing force	400 Newtons	Ultraviolet recorder

Table 4

RESULTS FOR HARD CHINE MODEL (CONFIGURATION 1) IN SEA STATE 3

Run No	AEW Star Run No	Model Speed (m/s)	Trim Flap Angle (Degs)	Rms				Figure No	Mean Resistance (Newtons)	Deduced	
				Pitch (Degs)	Heave (CM)	CG Accel (G)	Bow Accel (G)			Calm Resistance (N)	Resistance Increase (N)
15/2	878	1.820	20	2.13	1.893	0.176	0.235	1.521	-	-	-
15/3	879	3.883	4	0.795	1.078	0.140	0.198	1.073	35.14	27.58	7.56
15/7	883	3.854	4	1.136	1.686	0.232	0.244	2.256*	33.81	27.58	6.23
15/8	884	3.901	4	1.135	1.556	0.234	0.236	1.55	32.92	27.58	5.34
15/12	888	5.78	2.5	1.164*	2.418*	0.379*	0.664*	2.59*	64.05	44.93	19.12
15/13	889	5.771	2.5	0.813	1.31	0.34	0.357	2.068	68.46	44.48	23.98
15/14	890	5.808	2.5	0.73	1.241	0.305	0.291	1.634	64.14	44.48	19.66
15/15	891	5.809	2.5	1.212*	1.338	0.331	0.301	1.747	64.28	44.48	19.80

Table 5

RESULTS FOR HARD CHINE MODEL (CONFIGURATION 1) IN SEA STATE 5

Run No	AEW Star Run No	Model Speed (m/s)	Trim Flap Angle (Degs)	Rms					Figure No	Mean Resistance (Newtons)	Deduced	
				Pitch (Degs)	Heave (CM)	CG Accel (G)	Bow Accel (G)	Wave (CM)			Calm Resistance (N)	Resistance Increase (N)
15/17	893	1.804	20	3.623	5.545*	0.300	0.368	3.163	36-39	20.02	16.9	3.12
15/18	894	1.805	20	3.462	3.967	0.326	0.376	3.179	40-44	19.57	16.9	2.67
15/19	896	3.859	4	2.42	3.289	0.423	0.447	2.961	45-49	36.92	27.58	9.34
15/20	897	3.864	4	1.812	2.963	0.377	0.393	2.709	50-54	37.36	27.58	9.78
15/21	898	3.866	4	1.789	-	0.302	0.306	2.488	55-58	35.59	27.58	8.01
15/22	899	3.864	4	1.981	-	0.423	0.396	2.738	59-62	34.25	27.58	6.67
15/23	900	3.891	4	1.208	1.717	0.244	0.239	1.985	63-67	32.38	27.58	4.8
15/31	908	5.715	2.25	2.02*	-	0.523	0.482	4.28*	68-69	62.72	44.48	18.24
15/32	909	5.701	2.25	1.496	-	0.540	0.488	2.893	70-73	58.67	44.48	14.19

Table 6

RESULTS FOR ROUND BILGE MODEL WITH SPRAY REVERSERS (CONFIGURATION 2) IN SEA STATE 3

Run No	AEW Star Run No	Model Speed (m/s)	Trim Flap Angle (Degs)	Rms				Figure No	Mean Resistance (Newtons)	Deduced	
				Pitch (Degs)	Heave (CM)	CG Accel (G)	Bow Accel (G)	Wave (CM)		Calm Resistance (N)	Resistance Increase (N)
17/2	924	1.798	22	1.819	1.557	0.103	0.243	1.863	18.82	18.68	0.14
17/3	925	1.787	22	3.152*	2.324*	0.105	0.251	2.46*	19.57	18.68	0.89
17/6	928	3.837	11	1.003	1.608	0.180	0.326	1.655	32.47	26.24	6.23
17/7	929	3.842	11	1.122	1.714	0.194	0.341	1.723	32.92	26.24	6.68
17/8	930	3.842	11	1.060	1.676	0.186	0.339	1.663	32.47	26.24	6.23
17/9	931	3.847	11	1.033	1.661	0.186	0.313	1.746	33.81	26.24	7.57
17/13	935	5.805	3.5	0.786	1.886	0.262	0.406	1.671	48.93	37.36	11.57
17/14	936	5.811	3.5	1.289	2.023	0.279	0.466	1.927	49.37	37.36	12.01
17/15	937	5.807	3.5	0.886	2.094	0.26	0.405	2.02*	48.93	37.36	11.57

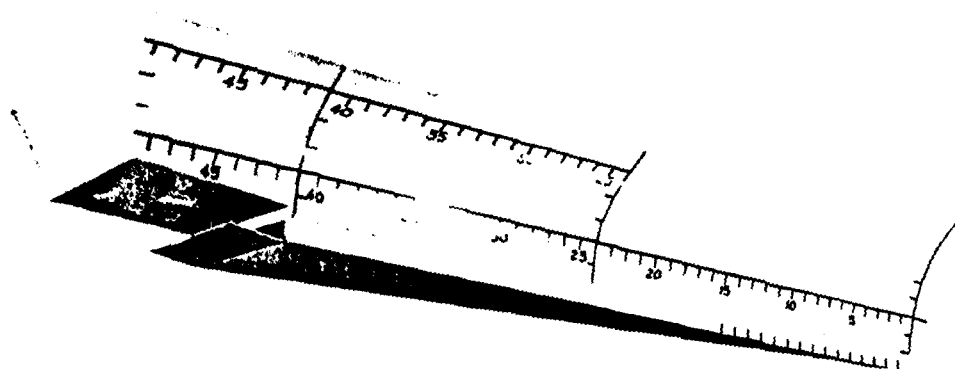


Figure 1

SEA KNIFE MODEL CONFIGURATION 1

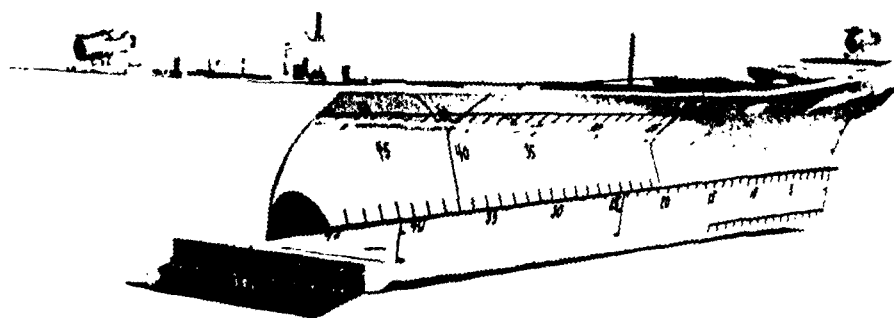


Figure 2

SEA KNIFE MODEL CONFIGURATION 2